

EVALUATION OF FIELD PERFORMANCE OF RESIDENTIAL FUEL CELLS

Research Team Members: NRECA's Cooperative Research Network
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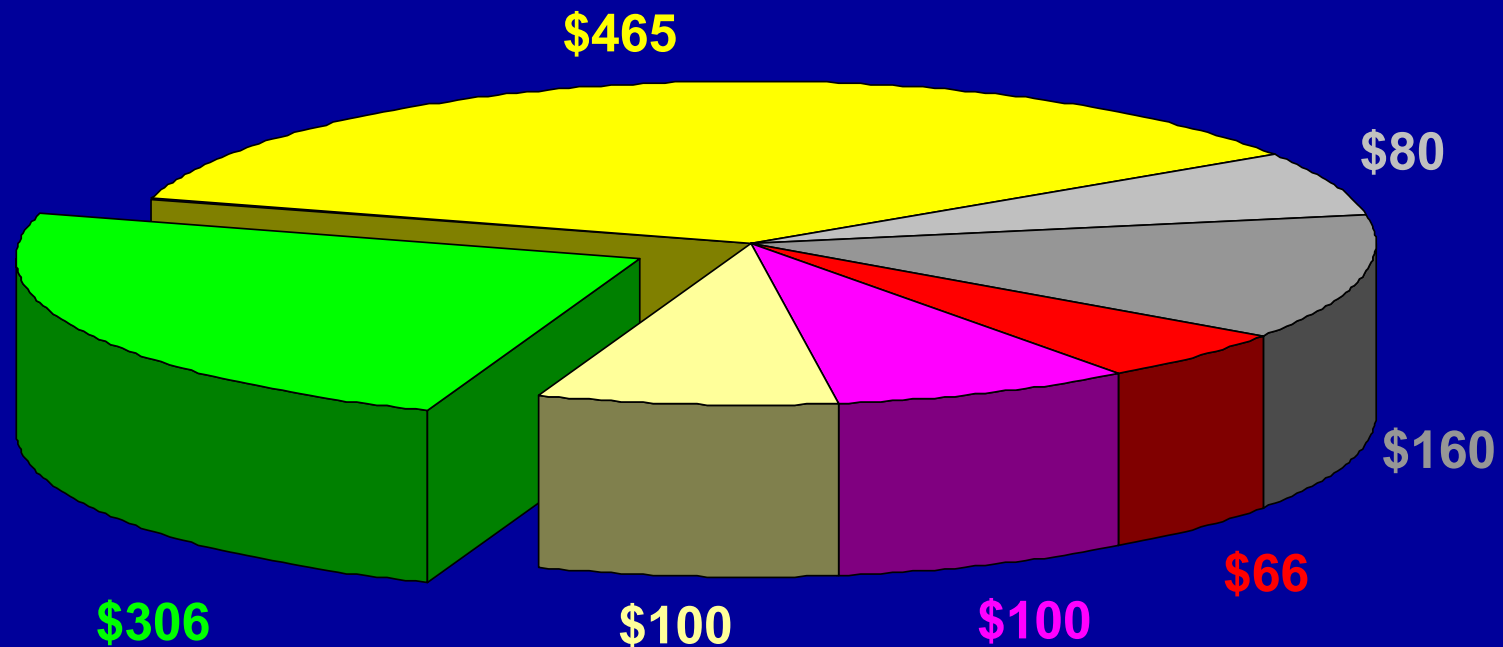
*NREL/DoE Distributed Power Program
Subcontract No. 30605 -12*

CRN RFC Demonstration Purpose . . .

- **Ascertain key near-term / long-term DP benefits**
 - Improved reliability and reduced service cost
 - Grid support for rural feeders
 - Reduced cost to serve remote customers
- **Identify and resolve DP implementation barriers**
 - Electrical Interconnect / PQ / Fuel / Thermal Recovery
 - Regulatory and Institutional Issues (*permitting, safety, interconnection, codes, etc.*)
(Manufacturer cost and market application also crucial!)
- **Build solid foundation for co-op DP**
 - Establish RFC success experience base
 - Develop public awareness of DP function and benefits
- **Benchmark RFC technology for further effort**

CRN Program Profile . . .

- Significant DoE leveraging



■ DoE NREL Funding = 24%

■ DoD Program Data Inclusion

■ Potential 50% of Sox Unit

■ NRECA DG Interconnect Manual

■ NREA CRN

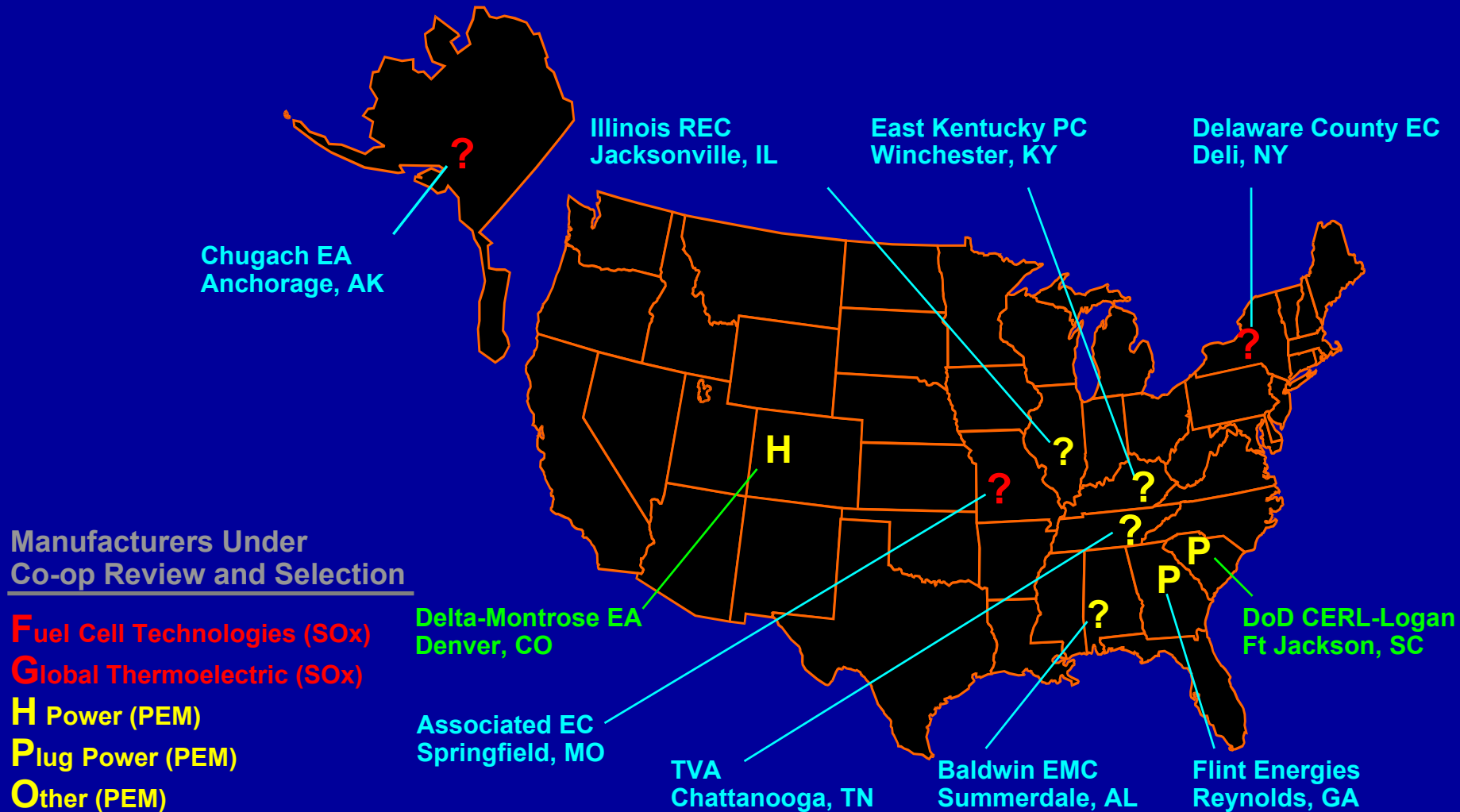
■ DoD Interconnect Testing

■ Epri Data Funding

*Thousands of Dollars
Total = \$1.28 million*

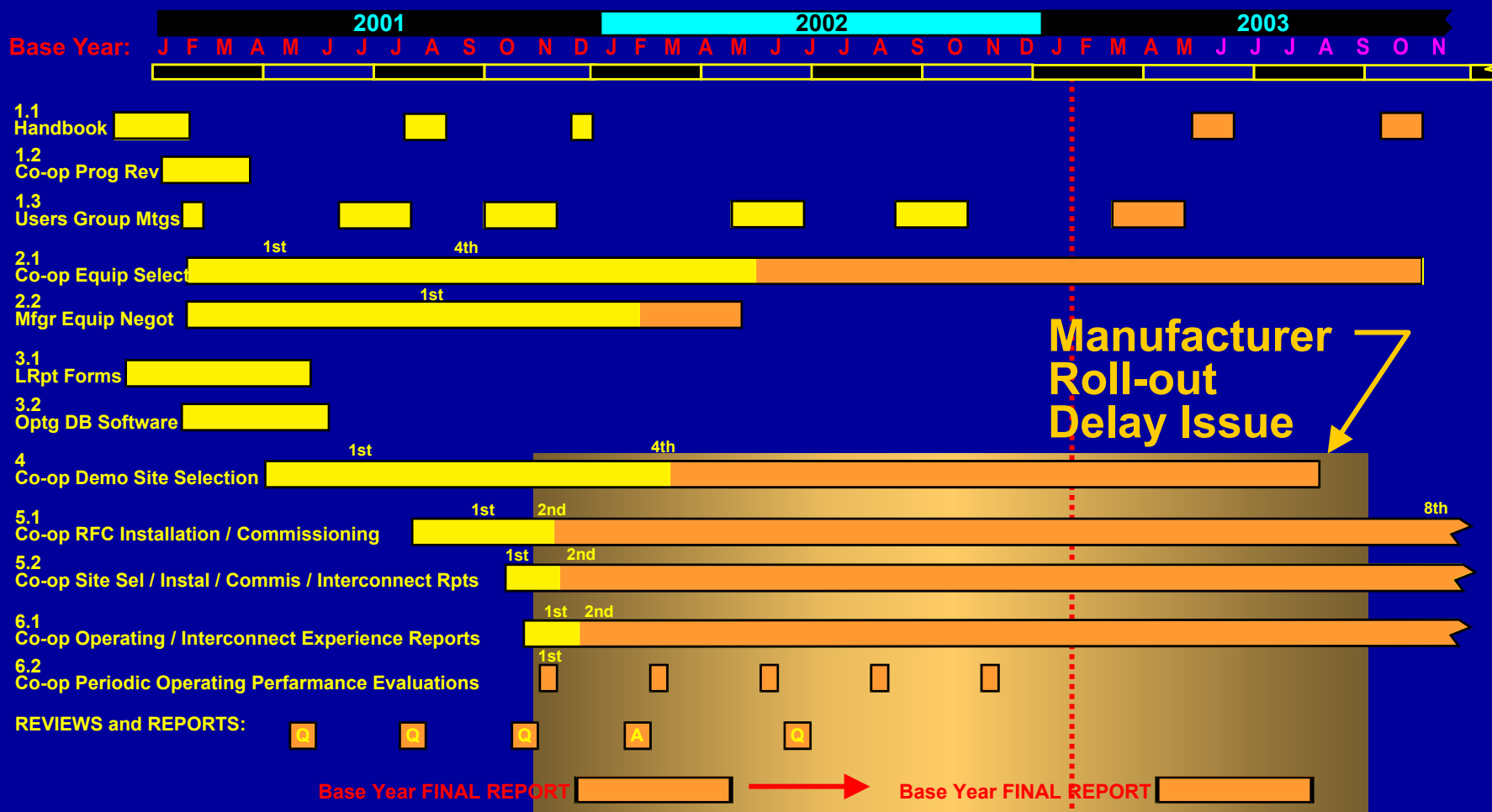
Broad Demonstration Program . . .

- Broad range of sites, climates, electric interconnects, and manufacturers

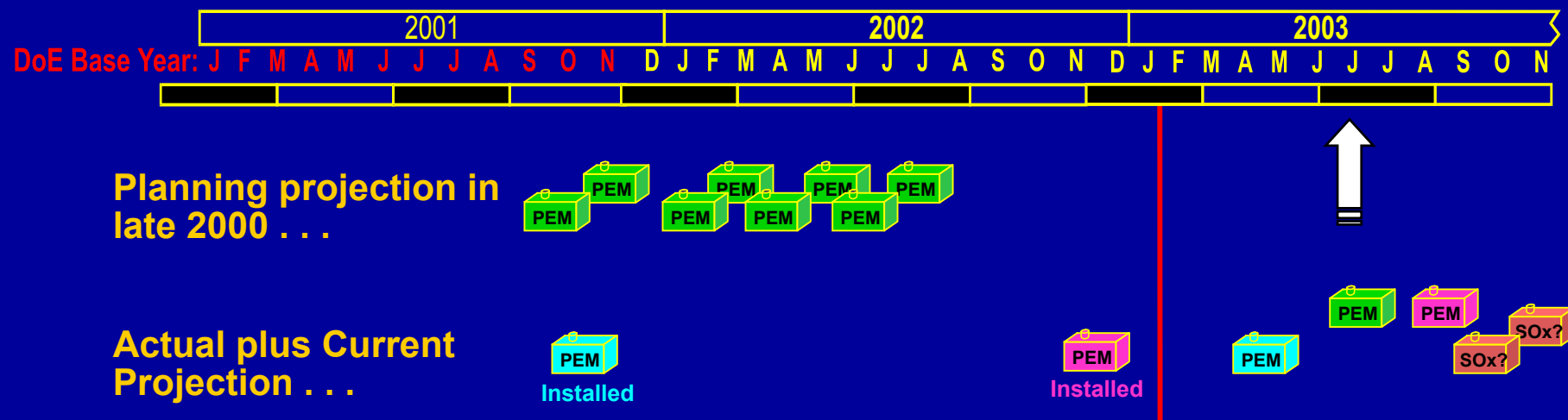


CRN-DoE Demo Program Status . . .

- Two units already installed. Manufactures delayed for balance till 2003.



Manufacturer Rollout Solution . . .



CRN Demo Program Corrective Actions:

- Substitute **PEM Beta** units for **PEM PreProduction** units
- Substituting **PEM DoD Mil Base** units for **Co-op PEM** units
- Considering **SOx** demo units to increase program utility
- Defer end of DoE Base Year and its report to mid-2003

Accomplishments in 2003 . . .

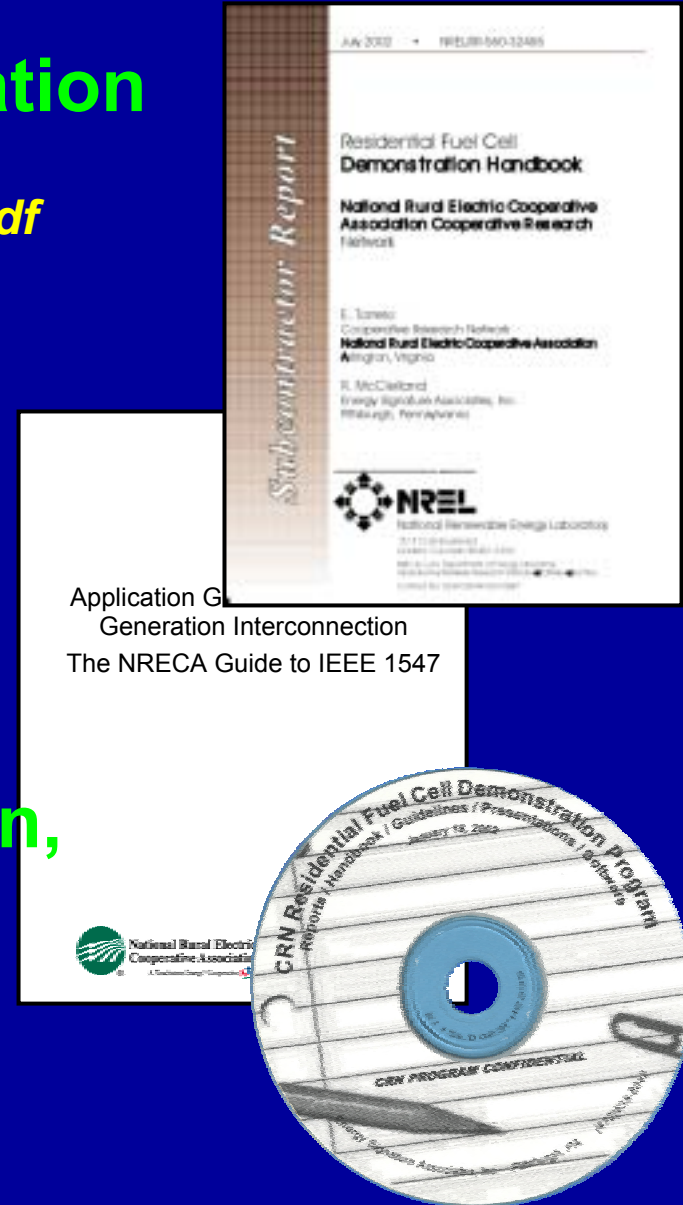
- **Completed RFC Demonstration Handbook for NREL Site**

<http://www.nrel.gov/docs/fy02osti/32455.pdf>

- **Published Co-op DG Tools including comprehensive Interconnect Guideline on NRECA Site** <http://www.nreca.org>

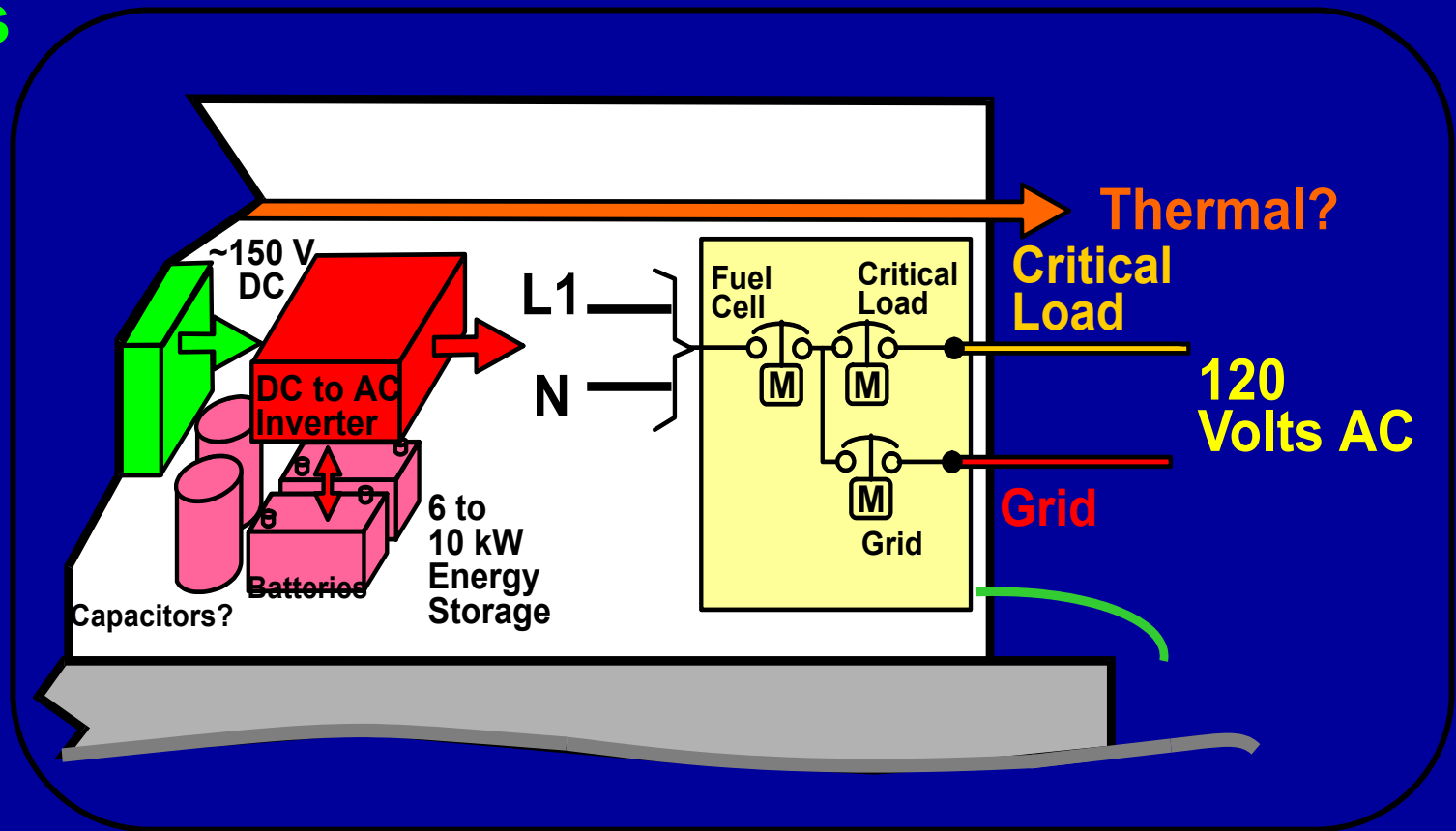
org/nreca/leg_reg/DGToolKit/index.html

- Completed all needed program guides: installation, metering, instrumentation, data collection, software, reporting, etc. as CRN RFC Demonstration ToolKit



Accomplishments in 2003 (cont'd) . . .

- Reviewed manufacturer Grid Interconnect plans



Accomplishments in 2003 (cont'd) . . .

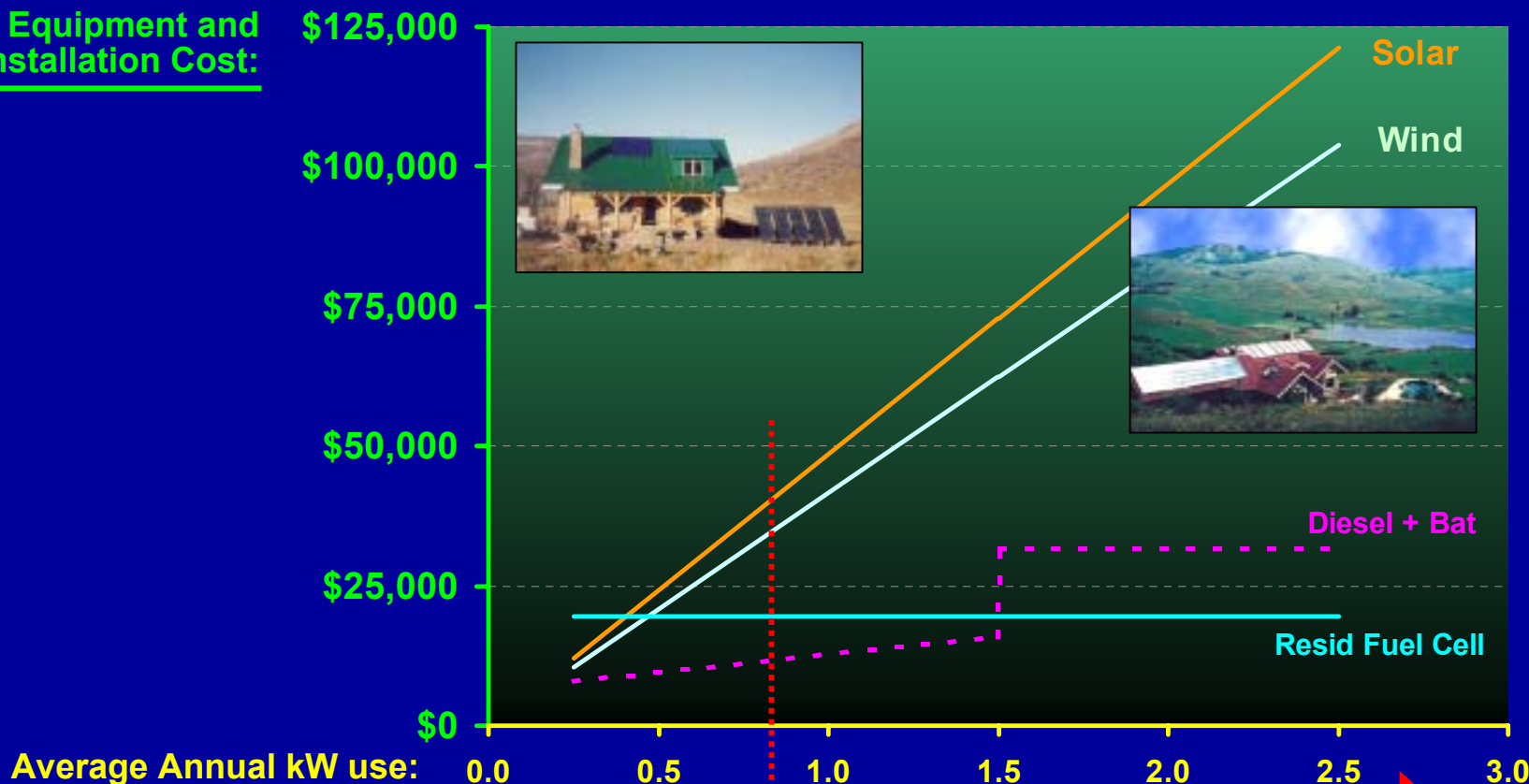
- **First two RFC site installations completed**
- **Completed Field Experience data base software**
- **Added DoD-CERL military base installations to program**
- **Added EPRI program to RFC Users Group**
- **Essentially completed CTC laboratory pre-installation RFC test protocols**
- **Began reviewing code issues**
- **Began processing market application issues**

Remote Residence Options . . .

Total Equipment and
Installation Cost:

Vacation Residence
DIY Back-to-Nature
A few lights at night

High End "Normal" Residence
Builder Scenic Subdivision
Close to "Grid Parallel" lifestyle



Residential Fuel Cell Market:

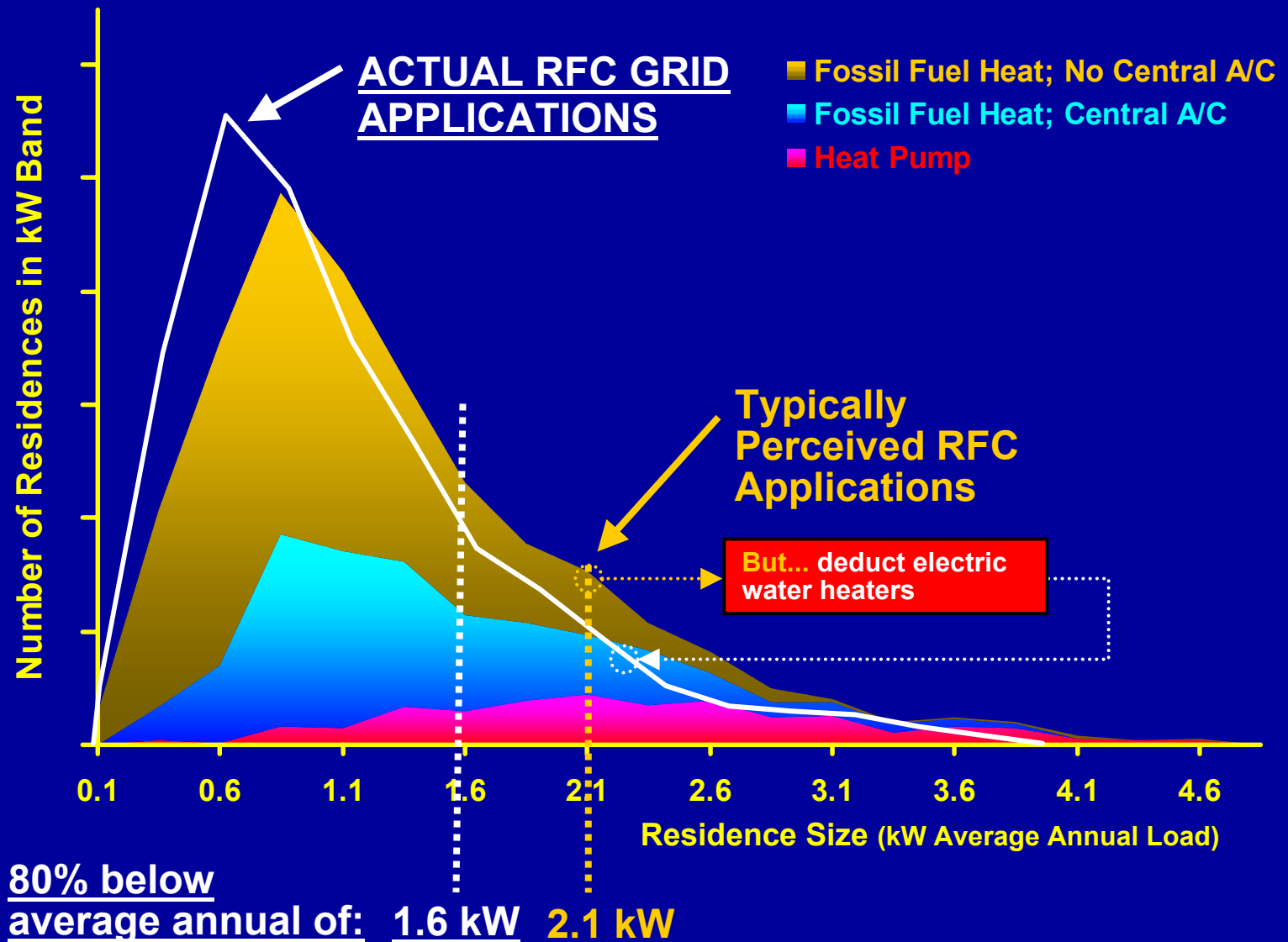
Above 4 kW of Installed Wind or Solar

≈ \$4,100 / year for either Wind, Solar, or RFC

Ultimate Remote Residence Option . . .



Grid Profile is Key to Mfr RFC Catalog . . .



Information Outreach . . .

- Co-op demos include a broad range of public awareness programs and outreach (*commissioning ceremonies, open houses, local group presentations, site tours, brochures, bill mailers, etc.*)
- Presentations to: co-op and industry working groups, DoE meetings, Joint Co-op/EPRI meetings, etc.
- RFC User Group meetings with manufacturers
- Significant joint effort with DoD-CERL
- EPRI now included in RFC Users Group
- Info and results posted on NRECA - CRN websites
- NRECA Annual Meeting displays/presentations reach over 5,000 senior co-op management and Directors